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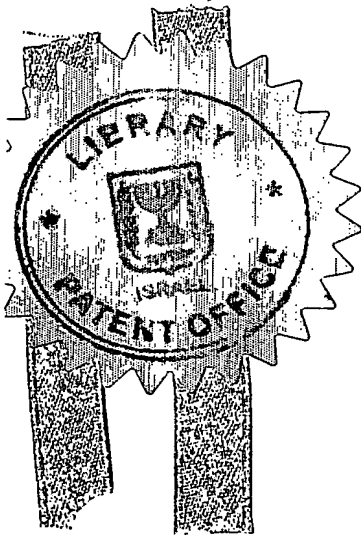
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PATENTS LAW, 5727 - 1967

בקשה לפטנט

Application for Patent

אני, (שם המבקש, מענו ולגבי גוף מאוגד - מקום התאגדותו)

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ת.ד. 637

יבנה 81104

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(בעברית)

(Hebrew)

ENHANCED MULTIPOINT LOCK

(באנגלית)

(English)

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עבור המבקש, For the Applicant, דוד קליין, עו"פ דקל פטנט בע"מ בית הרופאים מנוחה ונחלה 18, חדר 27, רחובות 76209		היום 19 בחודש 3 שנת 2002 This 19 of March 2003		
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מנעול רב-נקודתי משופר

**ENHANCED MULTIPOINT LOCK**

1287MUL-IL

## ENHANCED MULTIPOINT LOCK FIELD OF THE INVENTION

The present invention relates generally to multipoint locks, and particularly to multipoint locks with geometric locking or with end guides.

## BACKGROUND OF THE INVENTION

Lock assemblies for use with doors or windows, hinged or sliding, are well known in the art. Such lock assemblies typically include one or more movable lock members mounted at a vertical position along a free side edge of the door or window in close proximity with an actuator positioned for convenient manual operation. A handle or lever is normally included as part of the lock assembly and is adapted for manual rotation to retract the latch bolt and thereby permit the door or window to be opened.

Although door/window lock assemblies of the general type described above have performed their latching and/or locking functions in a generally satisfactory manner, there is a continuous need for further improvements in high security lock assemblies designed to safely and positively lock a door/window against unauthorized entry. Toward this end, so-called multipoint lock assemblies have been proposed with multiple lock members provided along the door/window side edge for engaging a corresponding number of keeper plates mounted on the adjacent door/window jamb. Generally the multipoint lock assembly is fashioned as an elongate member with locking bolts that may be thrown at the ends of the assembly.

US Patent 6,282,929 to Eller et al. describes a multipoint mortise lock assembly that includes an extended face piece mounted flush along the edge of a door, a mortise lock connected to the face piece, and a pair of hook bolt latch mechanisms mounted to the face piece above and below the mortise lock. An elongated actuator, which is preferably a flat rod slidably mounted to the back of the face piece, acts to extend and retract the hook bolts in synchronism with a deadbolt in the mortise lock. The actuator is connected between a deadbolt arm in the mortise lock, which drives the deadbolt, and the hook bolt latch mechanisms. The deadbolt arm is driven conventionally, such as by a key or a thumb latch, and the design allows one hand operation of the multipoint mortise lock assembly. This assembly is basically used for a hinged door.

US Patent 5,373,716 to MacNeil, et al. describes another kind of multipoint lock assembly for use with a hinged or swinging door. This multipoint door lock assembly includes a plurality of latch pins for securing the door in a tightly closed condition. The

multiple latch pins are adapted for coordinated operation from a single or main actuator, in combination with a security deadbolt and a related panic release mechanism for quickly and easily unlocking and opening the door from the inside.

Multipoint lock assemblies that include geometric locking of locking members are also known. By "geometric locking" it is meant that a portion of the locking member moves in a channel, groove or similar passage, and at some point is prevented from moving further in the channel at least partially by a geometric shape or arrangement of the channel with respect to the locking member. For example, British Patent GB 2229488 to ABT Hardware Ltd. describes a multipoint lock that has a main unit and at least one auxiliary unit coupled by an actuating member which is operated by an operating member of the main unit to cause a locking element of the auxiliary unit to move between unlocked and locked positions. The auxiliary unit comprises an actuating mechanism that includes a drive transmission element to transmit drive from the actuating member to the locking element. The actuating member may be moved to bring the drive transmission element from a first, unlocked position to a second, locked position. Afterwards, further movement of the actuating member may geometrically lock the drive transmission element in its second, locked position.

#### SUMMARY OF THE INVENTION

The present invention seeks to provide an improved multipoint lock with geometric locking, and which may include novel end guides, as described more in detail hereinbelow.

There is thus provided in accordance with an embodiment of the present invention a multipoint lock comprising a locking mechanism adapted to selectively retract and extend at least one locking bolt relative to an elongate housing, wherein the locking mechanism comprises an arm pivotally attached to a lock actuator and constrained to travel in a channel formed in a linkage device linked to the at least one locking bolt, and wherein in a first position of the lock actuator, the arm is at a first limit of travel in the channel and is pivoted in a first angular direction with respect to the lock actuator so as to be geometrically locked at the first limit of travel. In a second position of the lock actuator, the arm may be at a second limit of travel in the channel and may be pivoted in a second angular direction with respect to the lock actuator so as to be geometrically locked at the second limit of travel. In the first position of the lock actuator, the locking bolt may be in an extended, locked position relative to the elongate housing, whereas in the second

position of the lock actuator, the at least one locking bolt may be in a retracted, unlocked position relative to the elongate housing.

In accordance with an embodiment of the present invention the lock actuator comprises a cylinder lock in meshed engagement with a toothed rack, wherein the arm is pivotally attached to the toothed rack.

Further in accordance with an embodiment of the present invention the linkage device comprises a stationary linkage element with a first channel formed therein and a movable linkage element with a second channel formed therein, the movable linkage element being linked to the at least one locking bolt, and the arm being received in both the first and second channels. The first channel may be arcuate and the second channel may be generally straight.

Still further in accordance with an embodiment of the present invention the at least one locking bolt is arranged to pass through at least one aperture formed in an end guide.

In accordance with an embodiment of the present invention the end guide is formed with first and second apertures mutually spaced apart, and the end guide is mounted in the elongate housing such that the at least one locking bolt is arranged to pass through the first and second apertures. The at least one aperture may be formed on a face of the end guide parallel to another face that prevents passage therethrough of the at least one locking bolt. The end guide may be mounted separately from the elongate housing and comprise a cover.

There is also provided in accordance with an embodiment of the present invention a multipoint lock comprising a locking mechanism adapted to selectively retract and extend at least one locking bolt relative to an elongate housing, and an end guide formed with first and second apertures mutually spaced apart and a third aperture angled with respect to the first and second apertures, the end guide being mountable with respect to the elongate housing in a first orientation wherein the at least one locking bolt is arranged to pass through the first and second apertures and protrude out of the end guide, and in a second orientation wherein the at least one locking bolt is arranged to pass through the third aperture but does not protrude out of the end guide.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the drawings in which:

Figs. 1 is a simplified exploded illustration of a multipoint lock, constructed and operative in accordance with an embodiment of the present invention;

Figs. 2A and 2B are simplified perspective and front-view illustrations, respectively, of an end guide of the multipoint lock of Fig. 1, in a position that prevents a locking bolt to pass all the way through the end guide;

Figs. 2C and 2D are simplified perspective and front-view illustrations, respectively, of the end guide of the multipoint lock of Fig. 1, in a position that permits a locking bolt to pass all the way through the end guide;

Fig. 3 is a simplified plan view illustration of the multipoint lock of Fig. 1, wherein a locking mechanism is in an extended position and is geometrically locked at a first limit of travel;

Fig. 4 is a simplified plan view illustration of the multipoint lock of Fig. 1, showing the locking mechanism in an intermediate position;

Fig. 5 is a simplified plan view illustration of the multipoint lock of Fig. 1, wherein the locking mechanism is in a retracted position and is geometrically locked at a second limit of travel; and

Figs. 6 and 7 are simplified pictorial illustrations of the multipoint lock of Fig. 1, respectively locking a door in horizontal and vertical orientations.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference is now made to Fig. 1, which illustrates a multipoint lock 10, constructed and operative in accordance with an embodiment of the present invention.

Multipoint lock 10 may comprise one or more locking bolts 12, which may be selectively retracted and extended relative to an elongate housing 14 by means of a locking mechanism 16. Housing 14 may be constructed, without limitation, from two halves 14A and 14B, which may be made of sheet metal or plastic, for example.

Locking mechanism 16 may comprise a cylinder lock 18 that cooperates with a lock actuator 20 to retract or extend the locking bolts 12. In the illustrated embodiment, cylinder lock 18 may comprise a gear wheel 22 that meshes with a pair of toothed racks 24 of lock actuator 20. Cylinder lock 18 may be protected by a cylinder guard 26 and may be mounted on a mounting block 28 secured to an inner surface of elongate housing 14.

An arm 30 may be pivotally attached to each toothed rack 24 of lock actuator 20 at a pivot 31. Arm 30 may be constrained to travel in a channel formed in a linkage device 32 linked to locking bolts 12. In the illustrated embodiment, linkage device 32 may comprise a stationary linkage element 34 with a pair of first channels 36 formed therein, and a pair of movable linkage elements 38, each with a second channel 40 formed therein. The movable linkage elements 38 may be linked to locking bolts 12 by means of brackets

42. A pin 43 of arm 30 may be received in both first and second channels 36 and 40. First channel 36 may be arcuate, while second channel 40 may be generally straight. Cylinder lock 18 may pass through openings 44 and 46 formed in housing half 14A and stationary linkage element 34, respectively. Housing half 14A serves as a cover for elongate housing 14.

Locking bolts 12 may be arranged to pass through end guides 50, which are illustrated more in detail in Figs. 2A-2D, to which reference is now additionally made. Each end guide 50 may be formed with first and second apertures 52 and 54, respectively, which are mutually spaced apart. A third aperture 56 may be angled with respect to (e.g., perpendicular to) first and second apertures 52 and 54. Third aperture 56 is formed on a face of end guide 50 parallel to another face 58 that prevents passage therethrough of locking bolt 12. In Fig. 1, end guides 50 are mounted in elongate housing 14 in a first orientation wherein the locking bolts 12 are arranged to pass all the way through first and second apertures 52 and 54 and protrude out of end guides 50 (this being the orientation shown in Figs. 2C and 2D). In this orientation, first and second apertures 52 and 54 are aligned with a longitudinal axis of elongate housing 14. End guides 50 may be secured to housing half 14B with mounting screws or other suitable hardware, and may be covered by housing half 14A.

In Fig. 1, another pair of end guides 50 are mounted outside of elongate housing 14 to a mounting structure 57 (such as on a door jamb or window frame, for example) in a second orientation wherein the locking bolts 12 are arranged to pass through third aperture 56 but do not protrude out of the end guides 50 (this being the orientation shown in Figs. 2A and 2B). In this orientation, third aperture 56 is aligned with the longitudinal axis of elongate housing 14. Each end guide 50 may comprise a cover 60.

Thus end guides 50 may be used inside or outside elongate housing 14, depending on the orientation of apertures 52, 54 and 56.

Reference is now made to Figs. 3-5. Fig. 3 illustrates a first position of lock actuator 20 of lock mechanism 16, wherein each arm 30 is at a first limit of travel in first channel 36 (and second channel 40) and is pivoted about pivot 31 in a first angular direction 62 with respect to toothed rack 24 of lock actuator 20 so as to be geometrically locked at the first limit of travel. In this first position of lock actuator 20, the locking bolts 12 are in an extended, locked position relative to elongate housing 14.

Fig. 4 illustrates an intermediate position of lock mechanism 16, wherein pin 43 of arm 30 has been moved in first and second channels 36 and 40 by appropriate turning of



gear wheel 22 of cylinder lock 18. Movable linkage elements 38 and locking bolts 12 have been moved inwards, as indicated by arrows 61.

Fig. 5 illustrates a second position of lock actuator 20, wherein each arm 30 is at a second limit of travel in first channel 36 (and second channel 40) and is pivoted about pivot 31 in a second angular direction 64 with respect to toothed rack 24 of lock actuator 20 so as to be geometrically locked at the second limit of travel. In this second position of lock actuator 20, the locking bolts 12 are in a retracted, unlocked position relative to elongate housing 14.

Reference is now made to Figs. 6 and 7, which illustrate multipoint lock 10, respectively locking a door 66 in horizontal and vertical orientations. It is appreciated that multipoint lock 10 may be used to lock other kinds of doors, safes, windows and the like.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. Rather the scope of the present invention includes both combinations and subcombinations of the features described hereinabove as well as modifications and variations thereof which would occur to a person of skill in the art upon reading the foregoing description and which are not in the prior art.

7  
CLAIMS

What is claimed is:

1. A multipoint lock comprising:  
a locking mechanism adapted to selectively retract and extend at least one locking bolt relative to an elongate housing,  
wherein said locking mechanism comprises an arm pivotally attached to a lock actuator and constrained to travel in a channel formed in a linkage device linked to said at least one locking bolt, and  
wherein in a first position of said lock actuator, said arm is at a first limit of travel in said channel and is pivoted in a first angular direction with respect to said lock actuator so as to be geometrically locked at said first limit of travel.
2. The multipoint lock according to claim 1, wherein in a second position of said lock actuator, said arm is at a second limit of travel in said channel and is pivoted in a second angular direction with respect to said lock actuator so as to be geometrically locked at said second limit of travel.
3. The multipoint lock according to claim 1, wherein in said first position of said lock actuator, said at least one locking bolt is in an extended, locked position relative to said elongate housing.
4. The multipoint lock according to claim 2 or claim 3, wherein in said second position of said lock actuator, said at least one locking bolt is in a retracted, unlocked position relative to said elongate housing.
5. The multipoint lock according to any of the preceding claims, wherein said lock actuator comprises a cylinder lock in meshed engagement with a toothed rack, wherein said arm is pivotally attached to said toothed rack.
6. The multipoint lock according to any of the preceding claims, wherein said linkage device comprises a stationary linkage element with a first channel formed therein and a movable linkage element with a second channel formed therein, said movable linkage element being linked to said at least one locking bolt, and said arm being received in both said first and second channels.
7. The multipoint lock according to claim 6, wherein said first channel is arcuate and said second channel is generally straight.
8. The multipoint lock according to any of the preceding claims, wherein said at least one locking bolt is arranged to pass through at least one aperture formed in an end guide.

9. The multipoint lock according to claim 8, wherein said end guide is formed with first and second apertures mutually spaced apart, and said end guide is mounted in said elongate housing such that said at least one locking bolt is arranged to pass through said first and second apertures.
10. The multipoint lock according to claim 8, wherein said at least one aperture is formed on a face of said end guide parallel to another face that prevents passage therethrough of said at least one locking bolt.
11. The multipoint lock according to claim 10, wherein said end guide is mounted separately from said elongate housing and comprises a cover.
12. A multipoint lock comprising:
  - a locking mechanism adapted to selectively retract and extend at least one locking bolt relative to an elongate housing; and
  - an end guide formed with first and second apertures mutually spaced apart and a third aperture angled with respect to said first and second apertures, said end guide being mountable with respect to said elongate housing in a first orientation wherein said at least one locking bolt is arranged to pass through said first and second apertures and protrude out of said end guide, and in a second orientation wherein said at least one locking bolt is arranged to pass through said third aperture but does not protrude out of said end guide.
13. The multipoint lock according to claim 12, wherein said end guide is mounted in said elongate housing with said first and second apertures aligned with a longitudinal axis of said elongate housing.
14. The multipoint lock according to claim 12 or claim 13, wherein said end guide is mounted on a structure separate from said elongate housing, with said third aperture aligned with a longitudinal axis of said elongate housing.
15. The multipoint lock according to claim 14, wherein said end guide comprises a cover.
16. The multipoint lock according to any of claims 12-15, wherein said third aperture is perpendicular to said first and second apertures.
17. The multipoint lock according to any of claims 12-16, wherein said locking mechanism comprises an arm pivotally attached to a lock actuator and constrained to travel in a channel formed in a linkage device linked to said at least one locking bolt, and wherein in a first position of said lock actuator, said arm is at a first limit of travel in said channel and is pivoted in a first angular direction with respect to said lock actuator so as to be geometrically locked at said first limit of travel.

18. The multipoint lock according to claim 17, wherein in a second position of said lock actuator, said arm is at a second limit of travel in said channel and is pivoted in a second angular direction with respect to said lock actuator so as to be geometrically locked at said second limit of travel.

19. The multipoint lock according to claim 17, wherein in said first position of said lock actuator, said at least one locking bolt is in an extended, locked position relative to said elongate housing.

20. The multipoint lock according to claim 18 or claim 19, wherein in said second position of said lock actuator, said at least one locking bolt is in a retracted, unlocked position relative to said elongate housing.

21. The multipoint lock according to any of claims 1-20 and substantially as shown and described hereinabove.

For the Applicant,



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Dekel Patent Ltd.

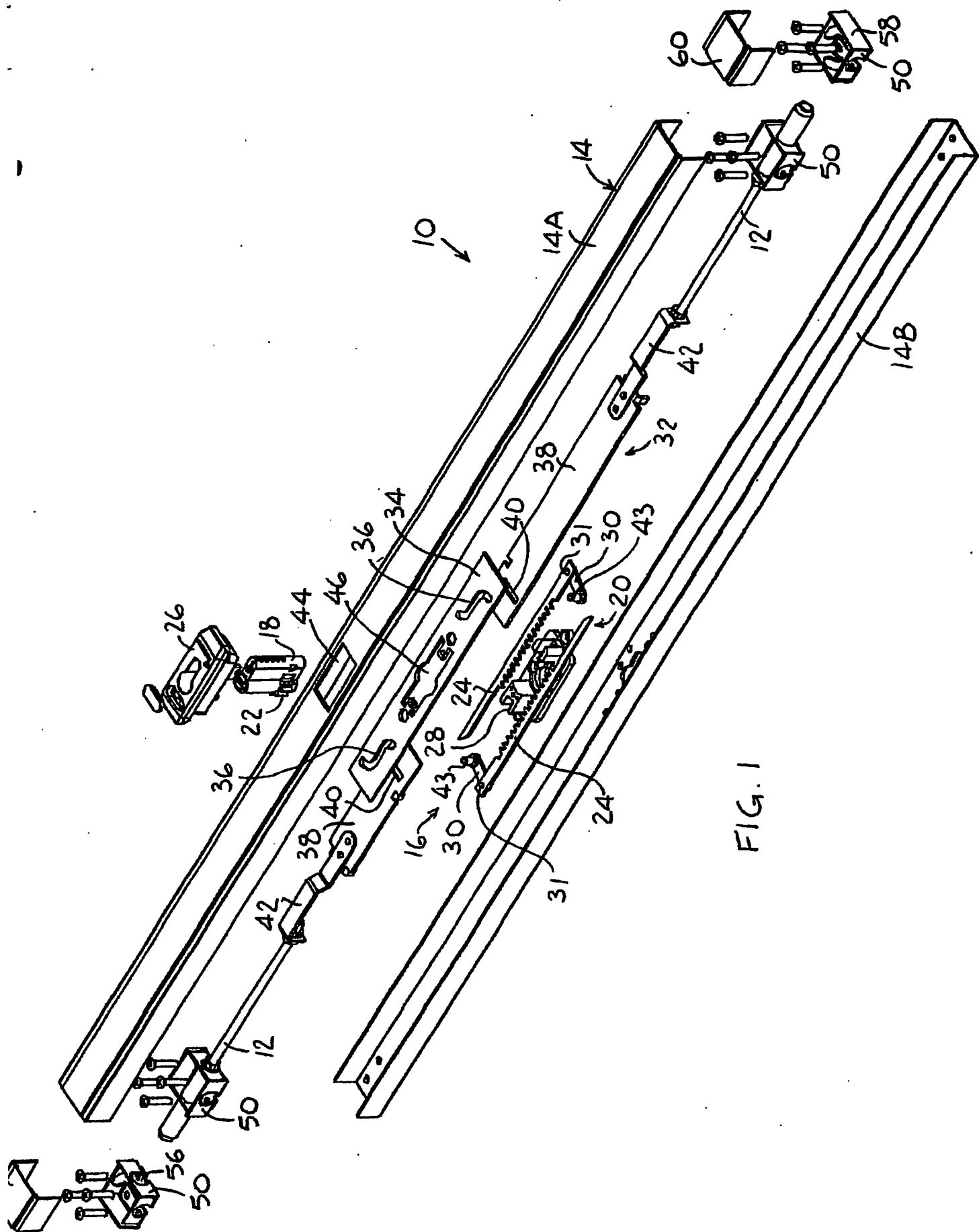
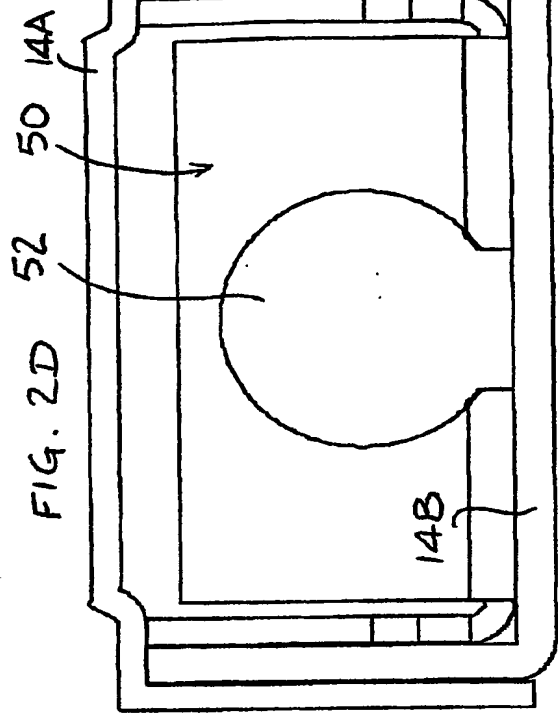
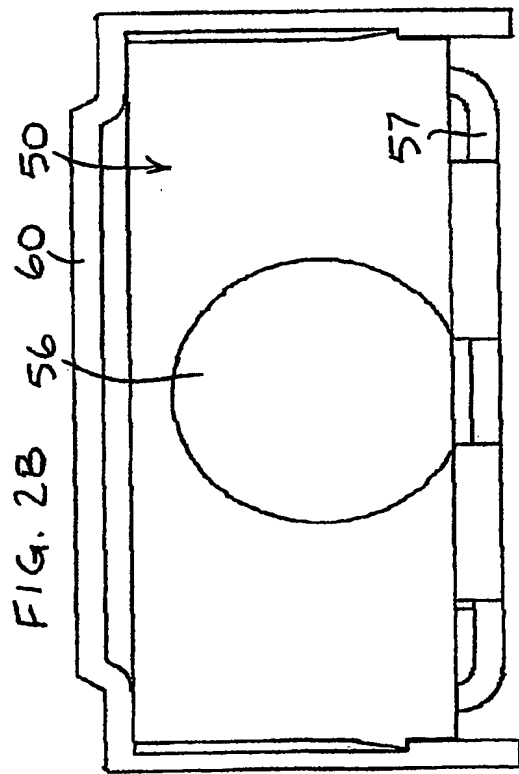
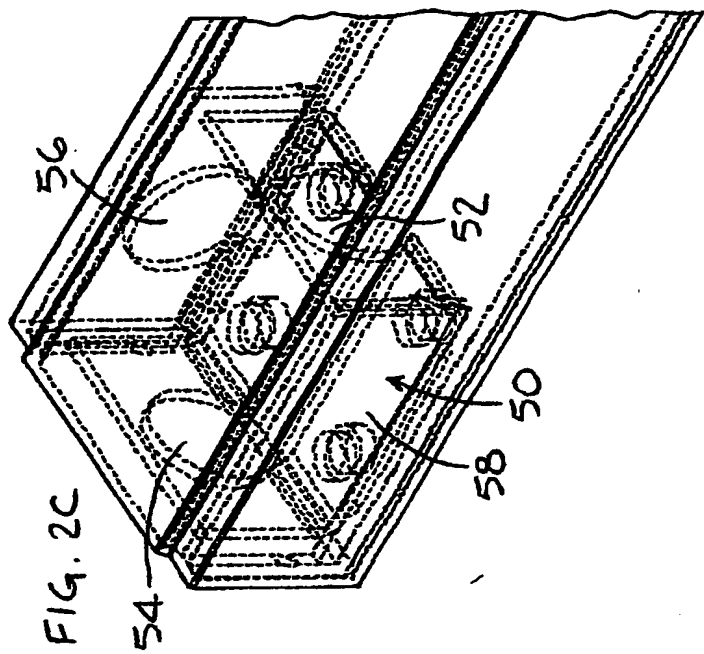
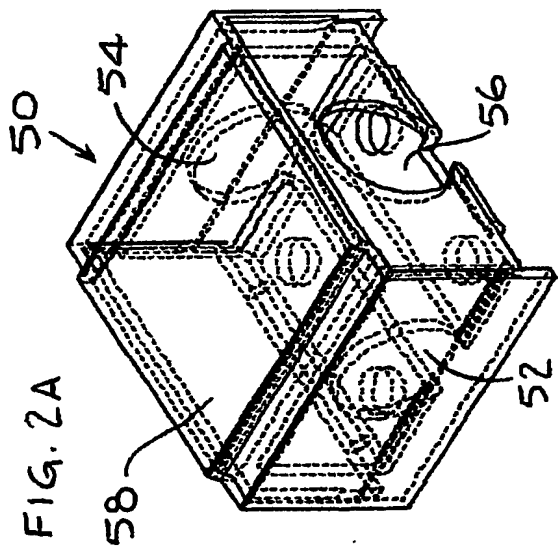


FIG. 1



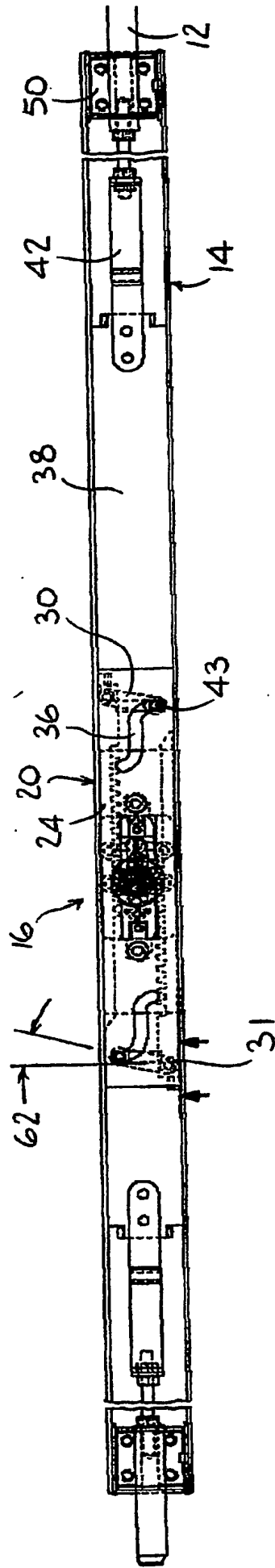
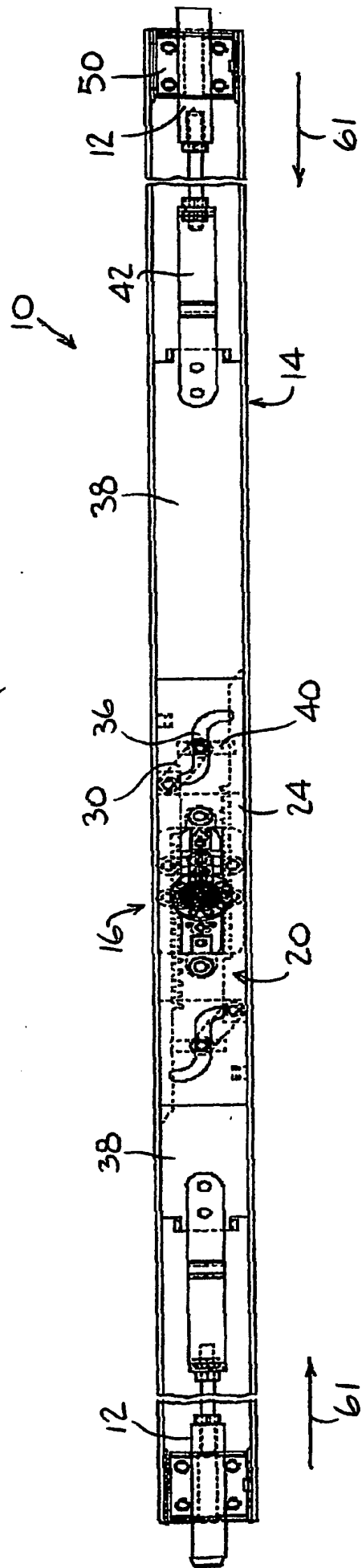
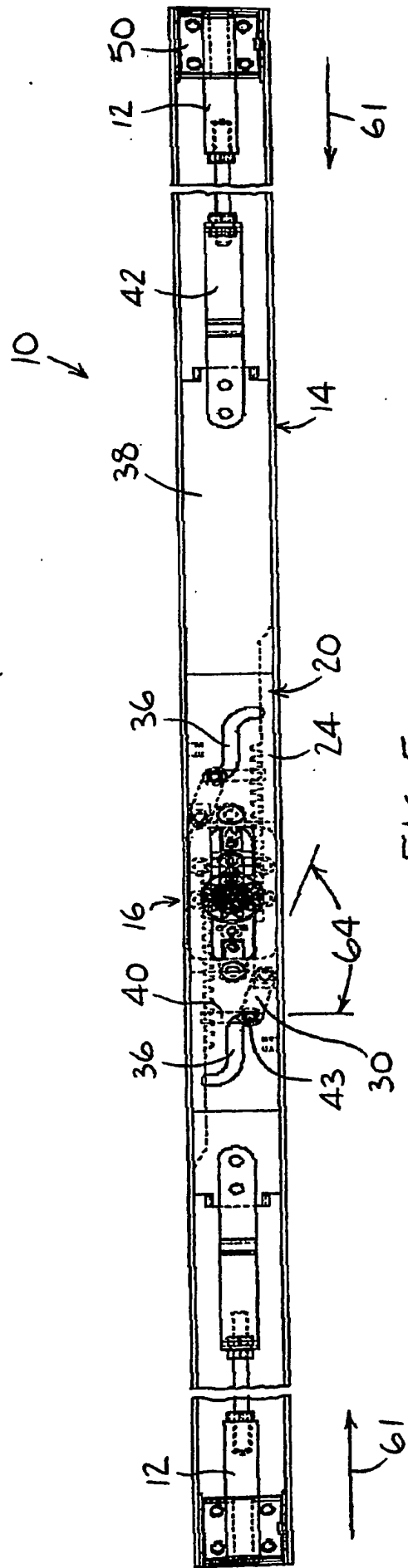


FIG. 3







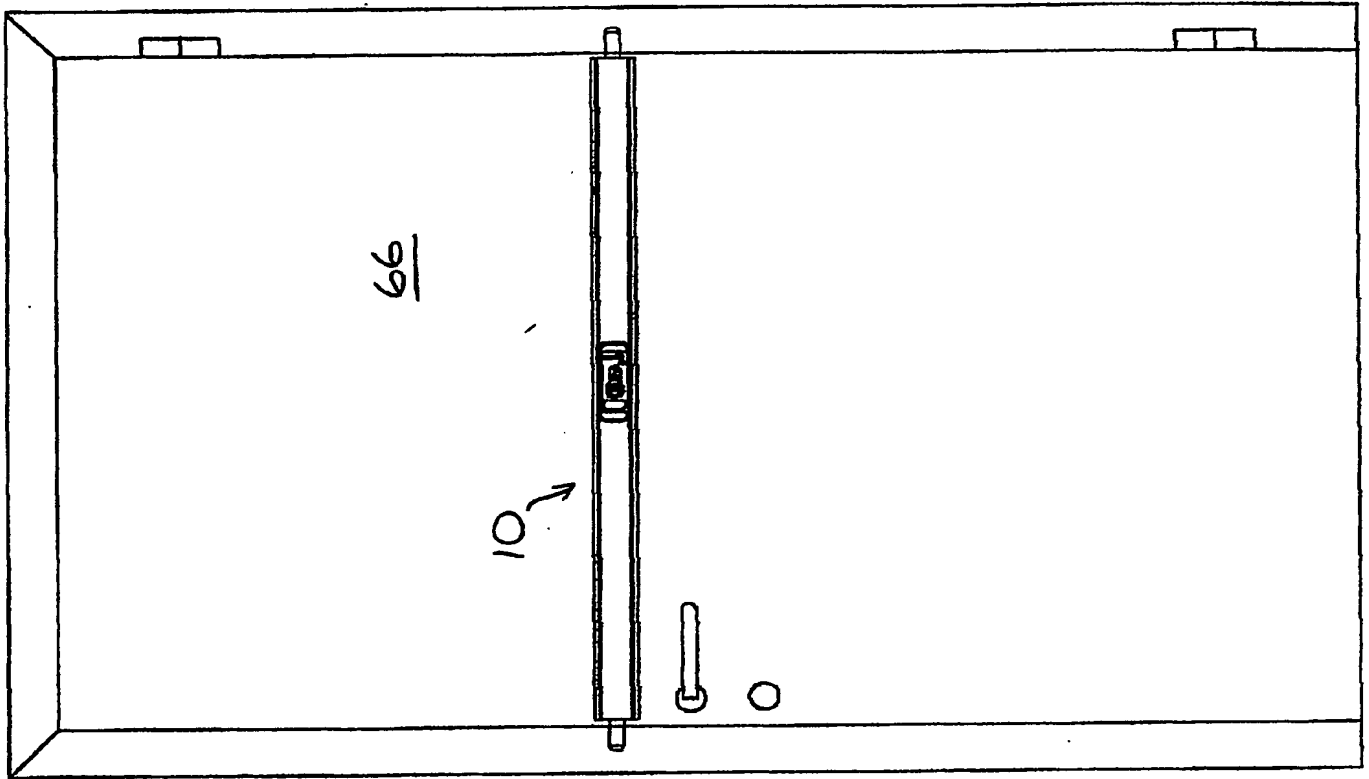


FIG. 6

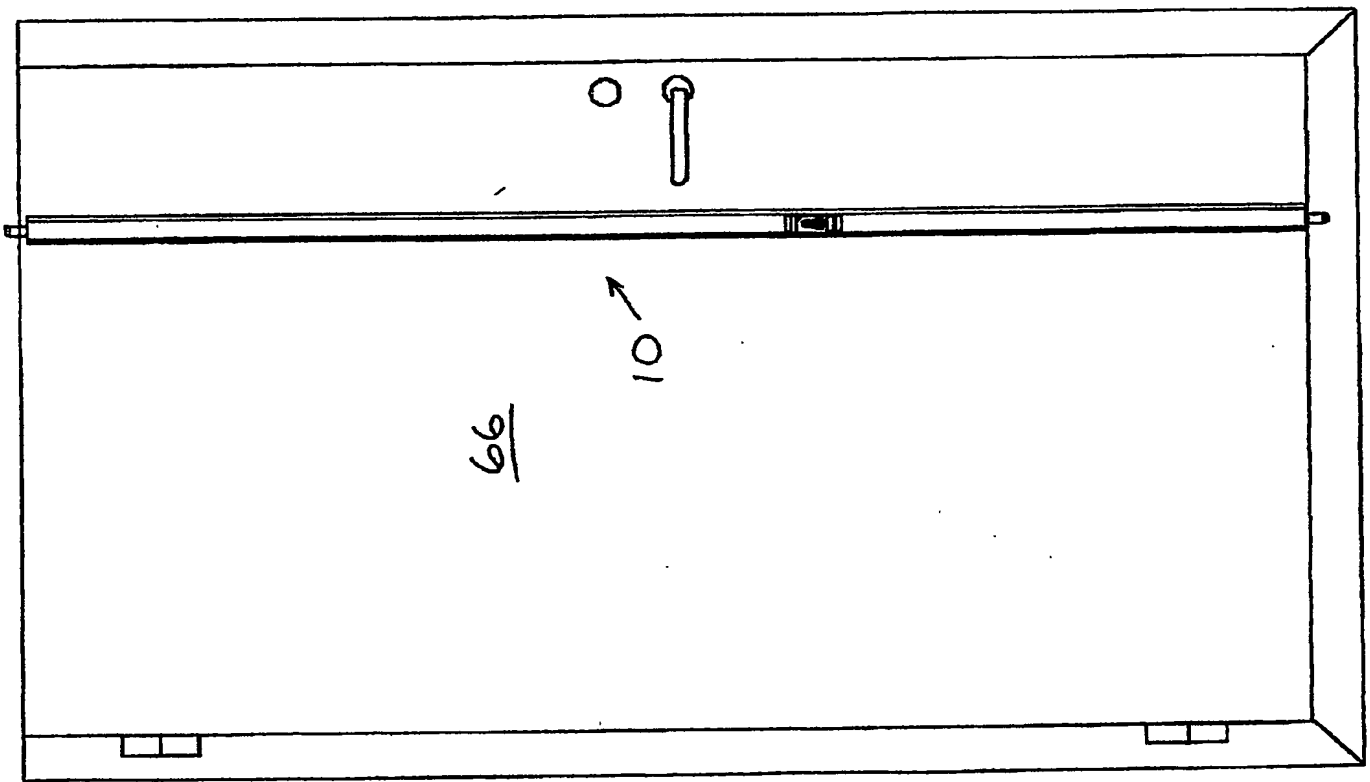


FIG. 7